US006161255A

United States Patent [19]

Garrett

[11] **Patent Number: 6,161,255**

[45] **Date of Patent: Dec. 19, 2000**

[54] **PRESSURE HINGE DEVICE FOR GLASS DOOR OR PANEL**

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[73] Assignee: **CHMI**, Keokuk, Iowa

[21] Appl. No.: **09/129,971**

[22] Filed: **Aug. 6, 1998**

[51] **Int. Cl.**[7] **E05D 11/10**

[52] **U.S. Cl.** **16/284**; 16/382; 16/331

[58] **Field of Search** 16/252, 332, 334, 16/382, 331, 322

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Primary Examiner—B. Dayoan
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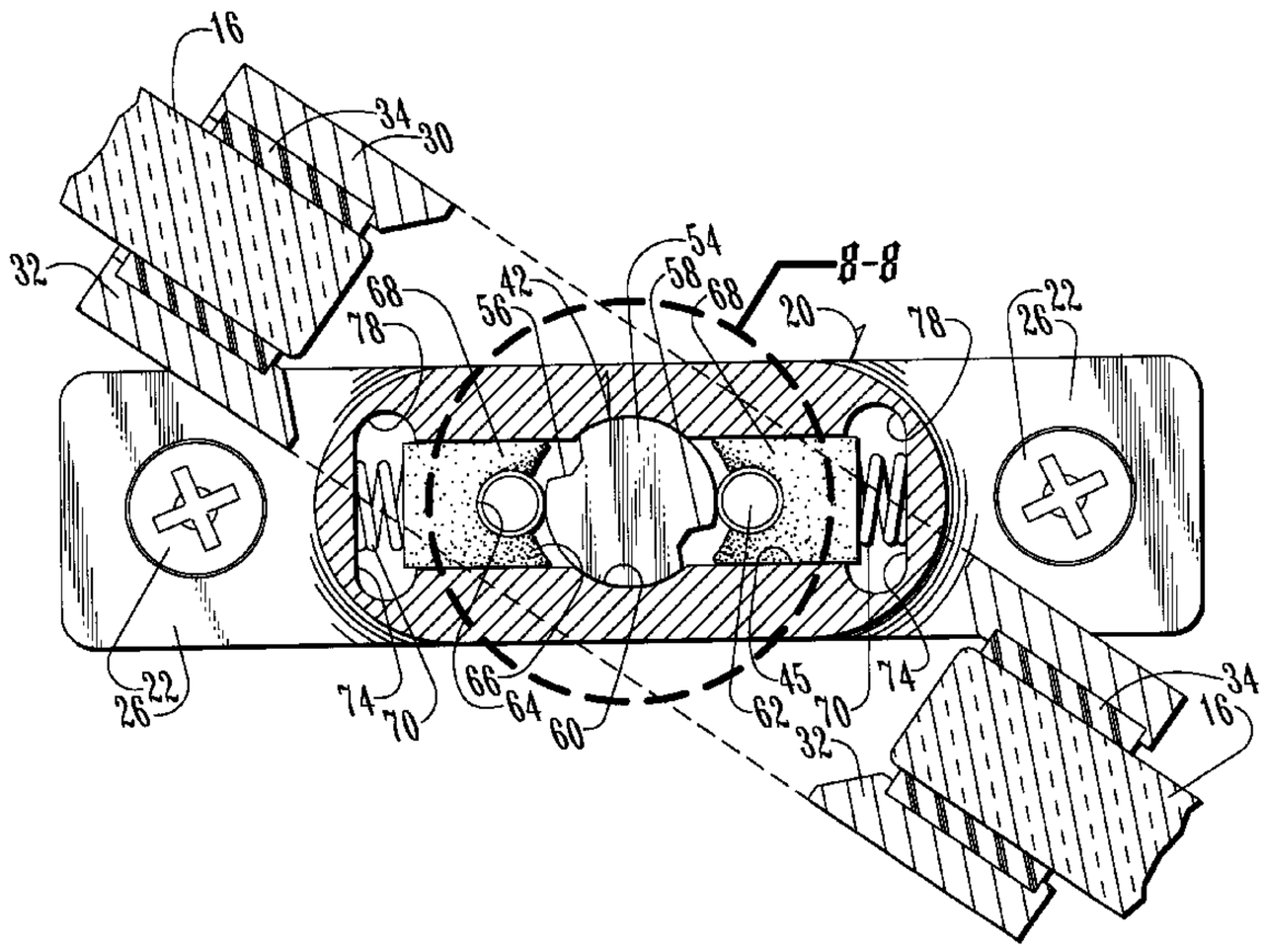
Attorney, Agent, or Firm—Zarley, McKee, Thomte, Voorhees & Sease

[57] **ABSTRACT**

An indexing hinge particularly useful for glass shower doors. A mounting member is mountable to the supporting structure around the opening to the shower. For example, this could be at the top and bottom of the opening to the shower. Another mounting member could clamp along the edge of the door. A pivot pin extends between the two mounting members and has one end rotatably journaled in one of the mounting members. A fixing mechanism in the other of the mounting members fixes the pivot pin relative to its respective member. An indexing member includes a detent along the pivot pin and a biased member that is urged against the pivot pin so that when the detent aligns with the biased member, in indexing position and indexing of the door is achieved.

70 Claims, 6 Drawing Sheets



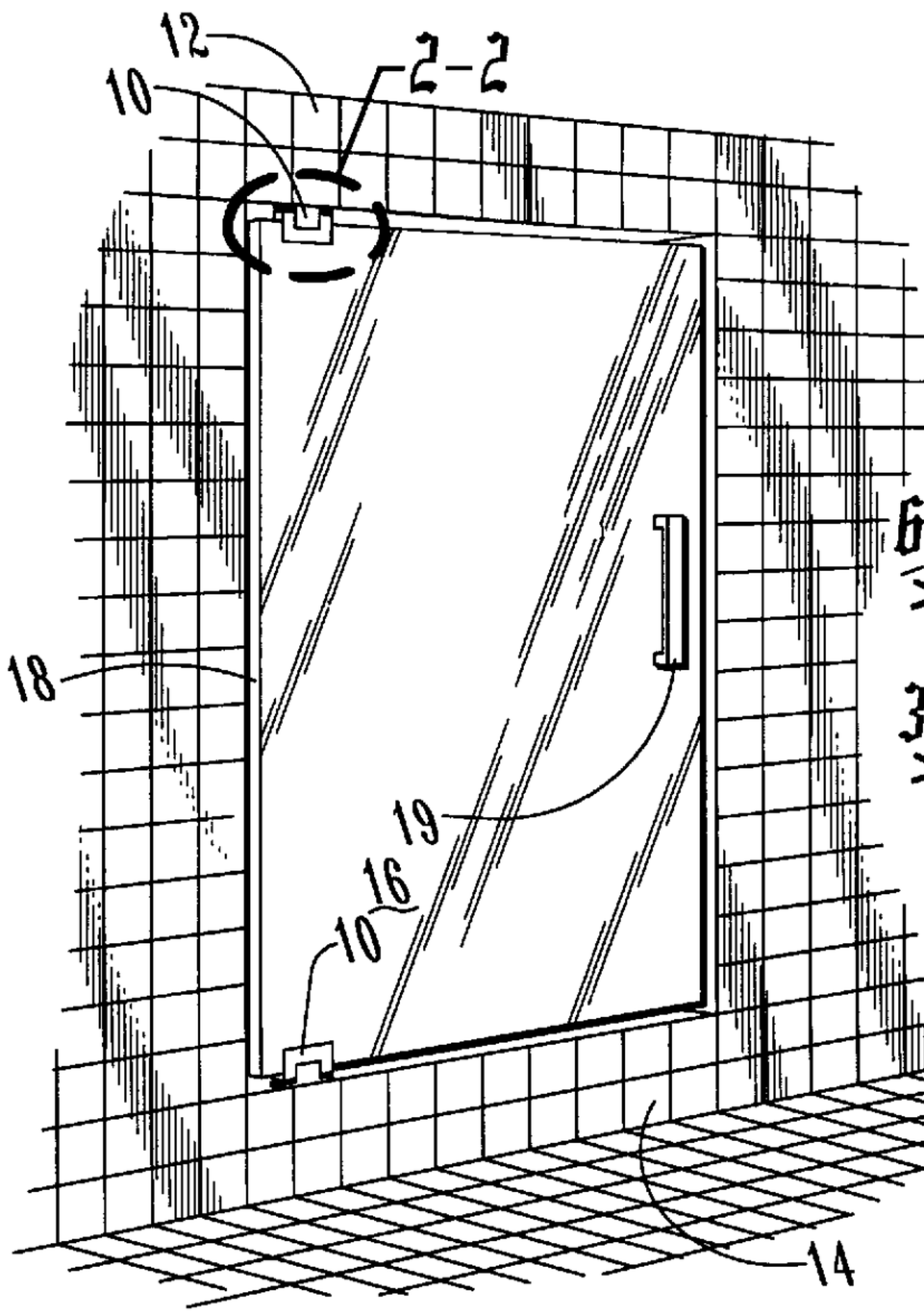


Fig. 1

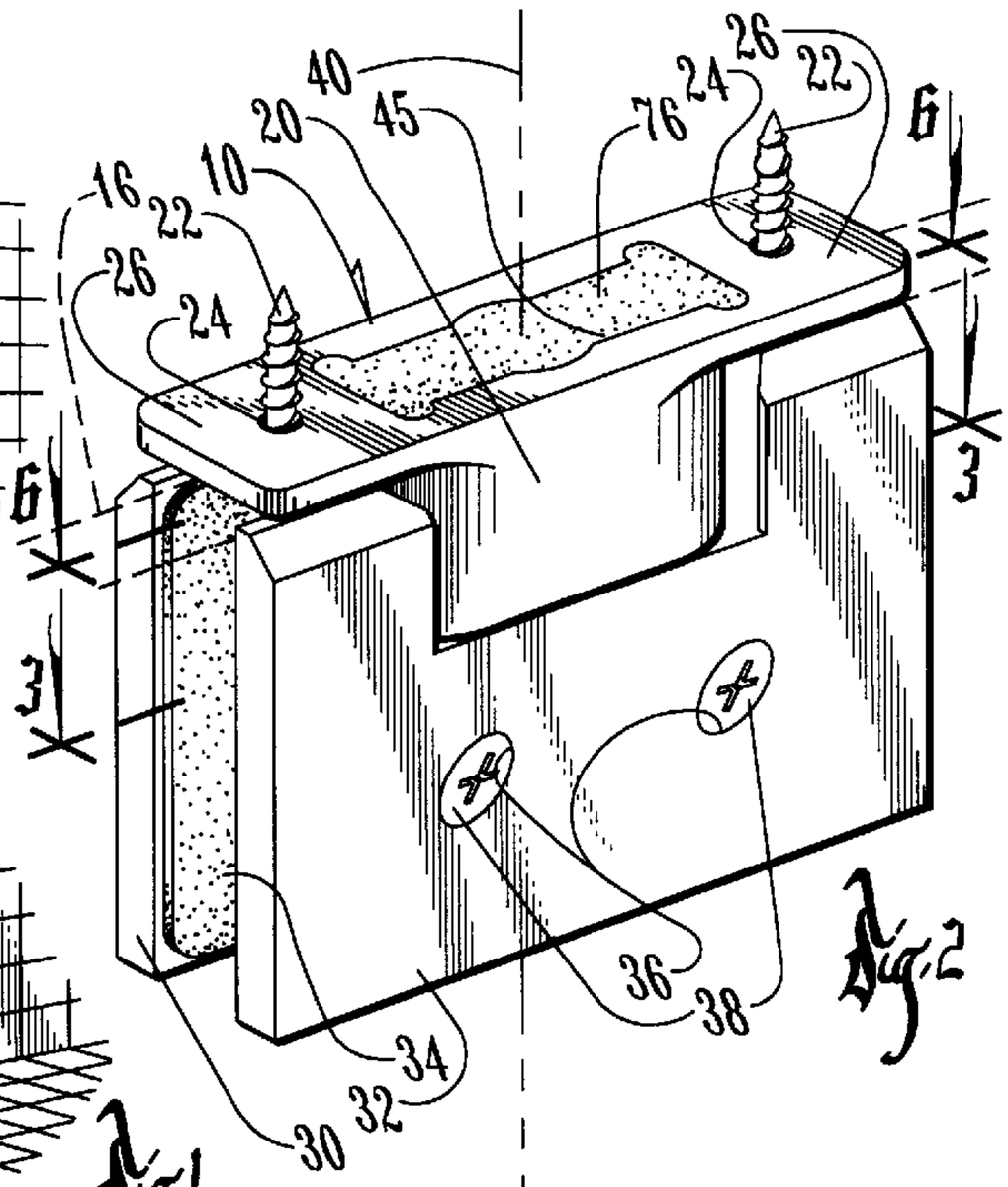


Fig. 2

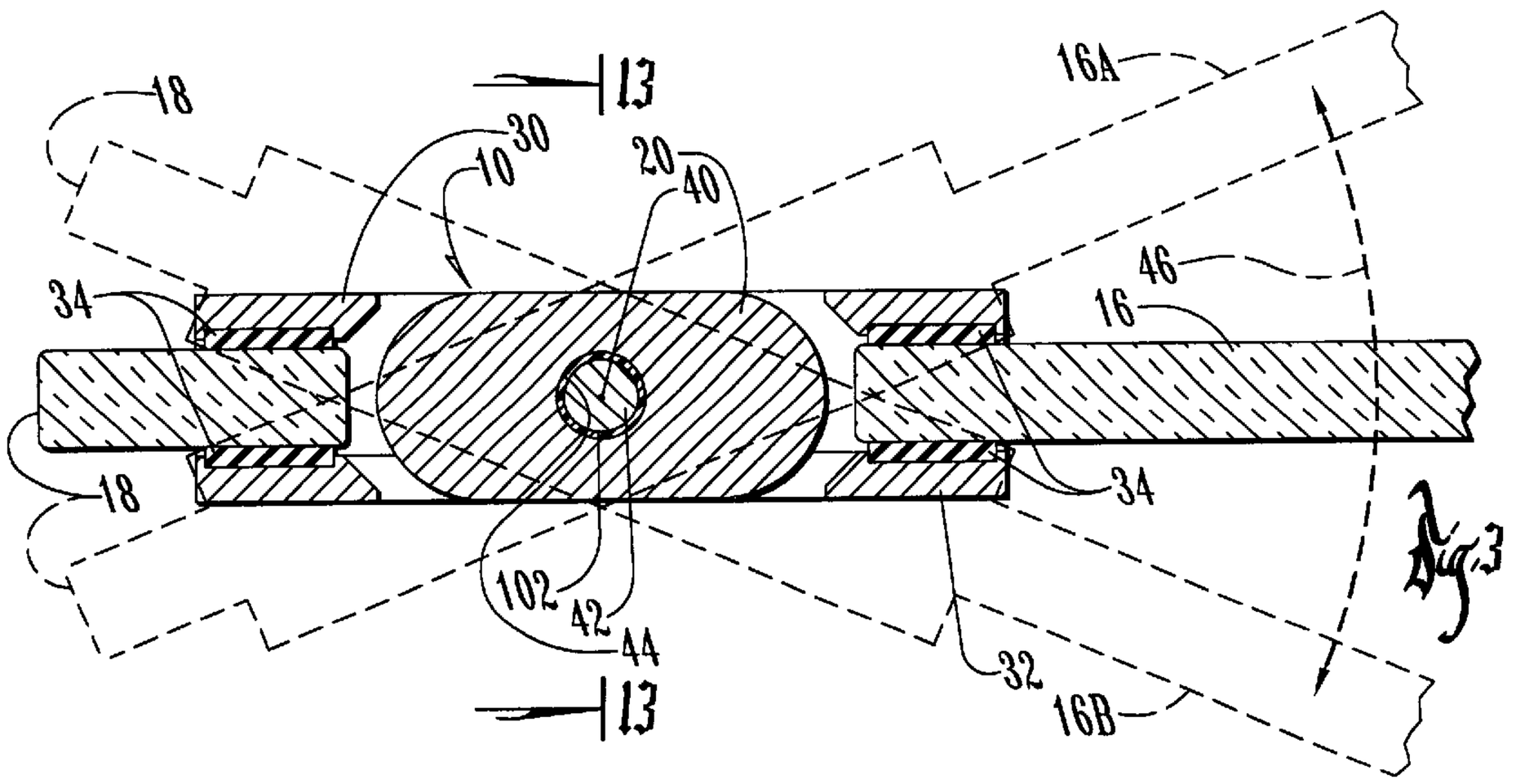


Fig. 3

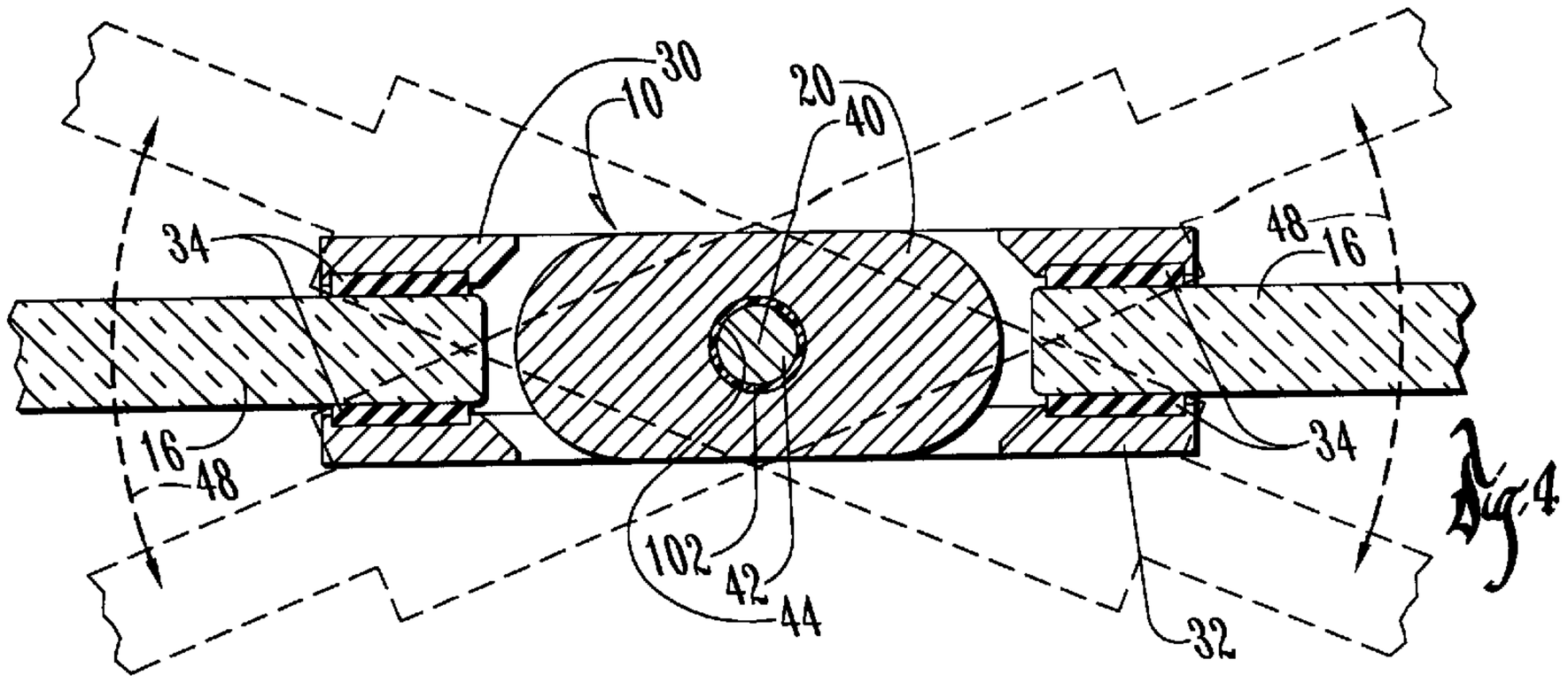


Fig. 4

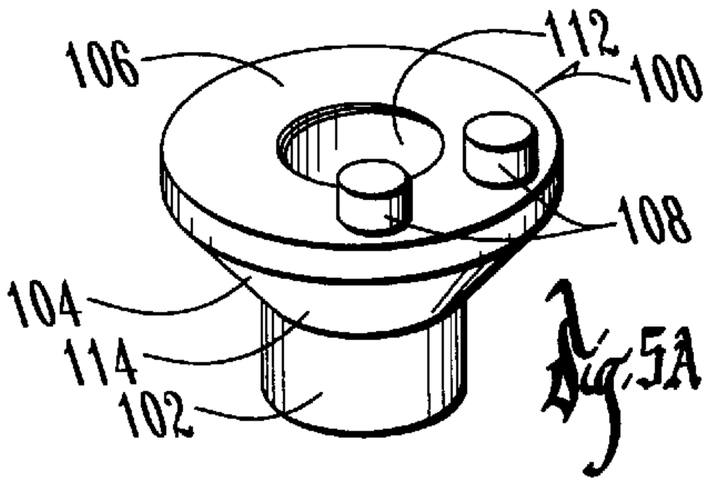
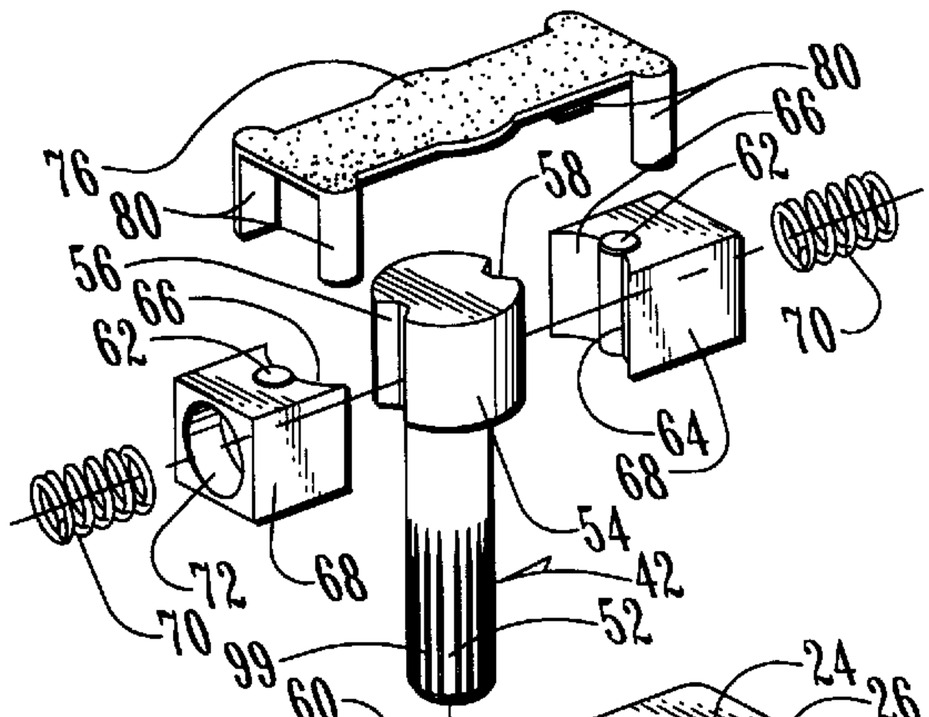


Fig. 5A



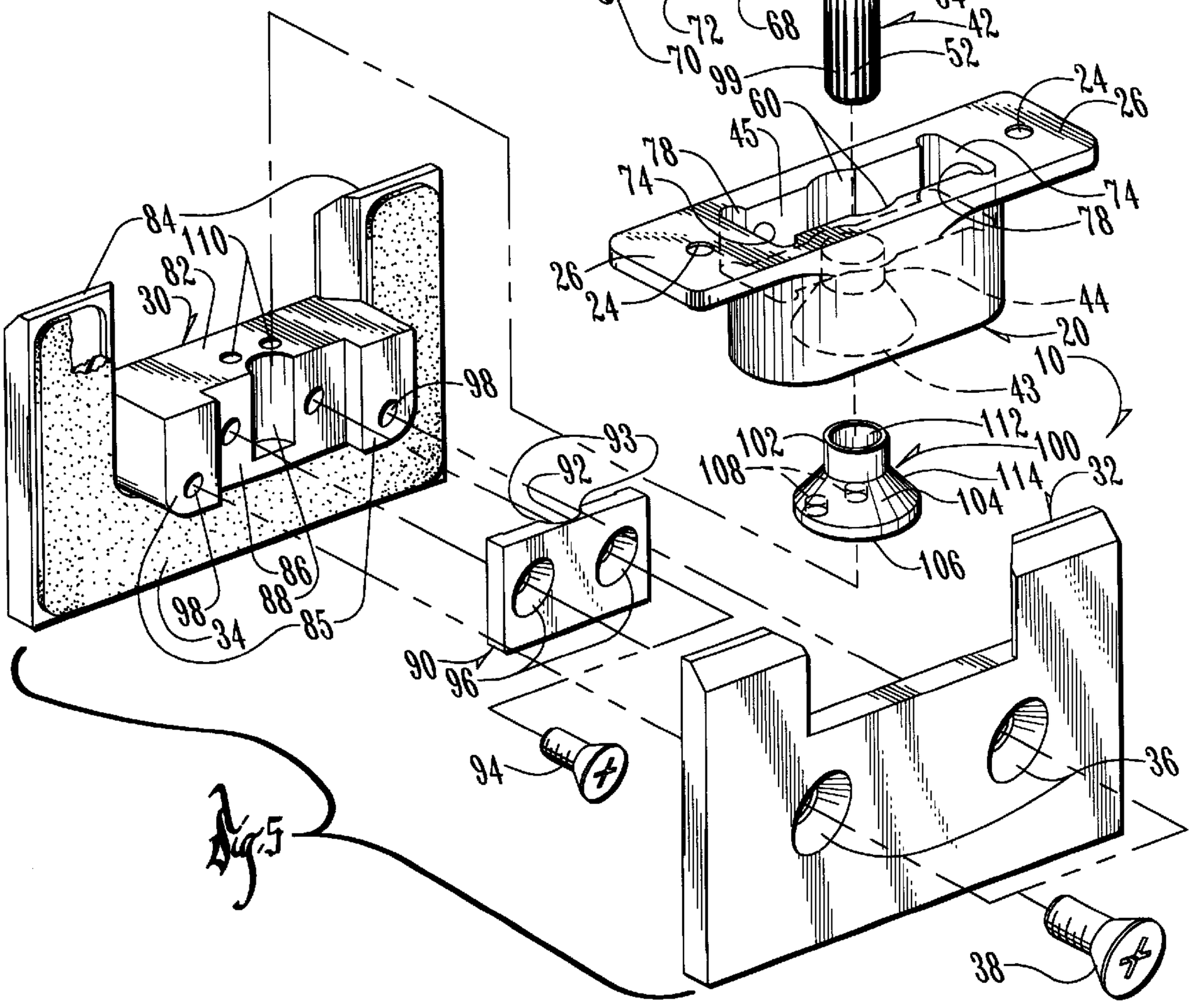
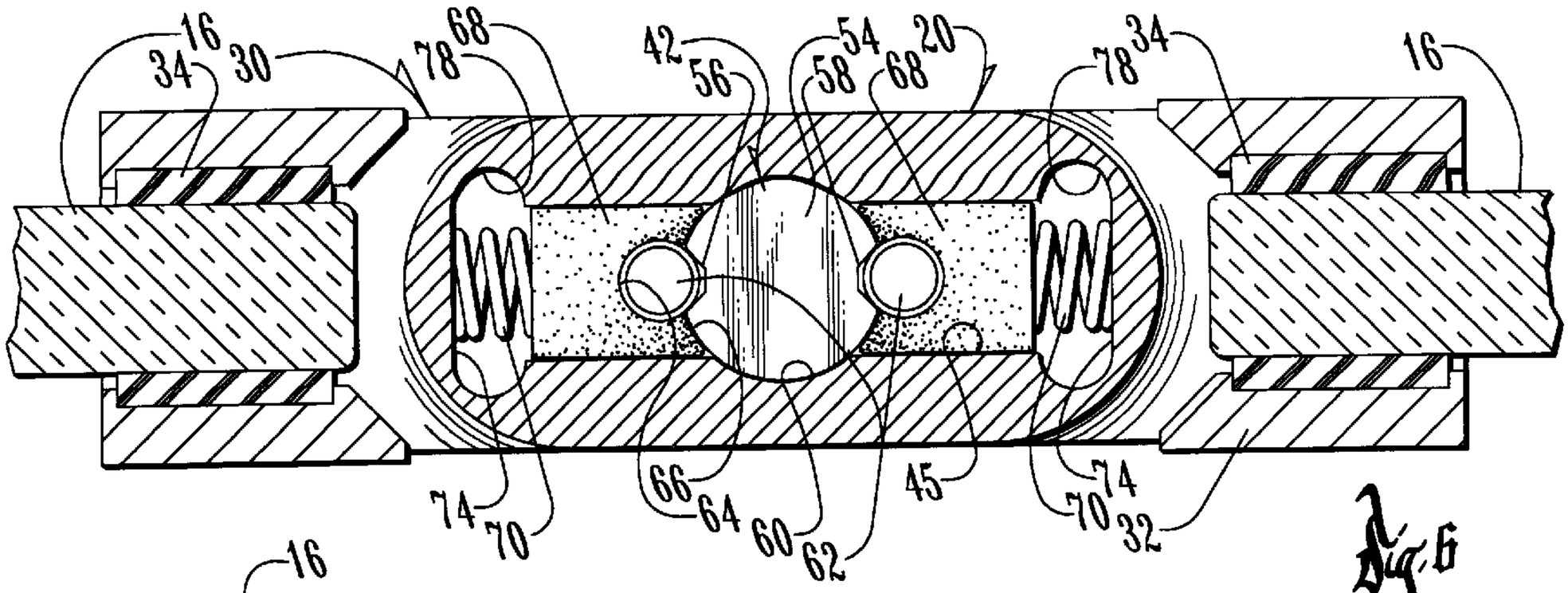


Fig. 5



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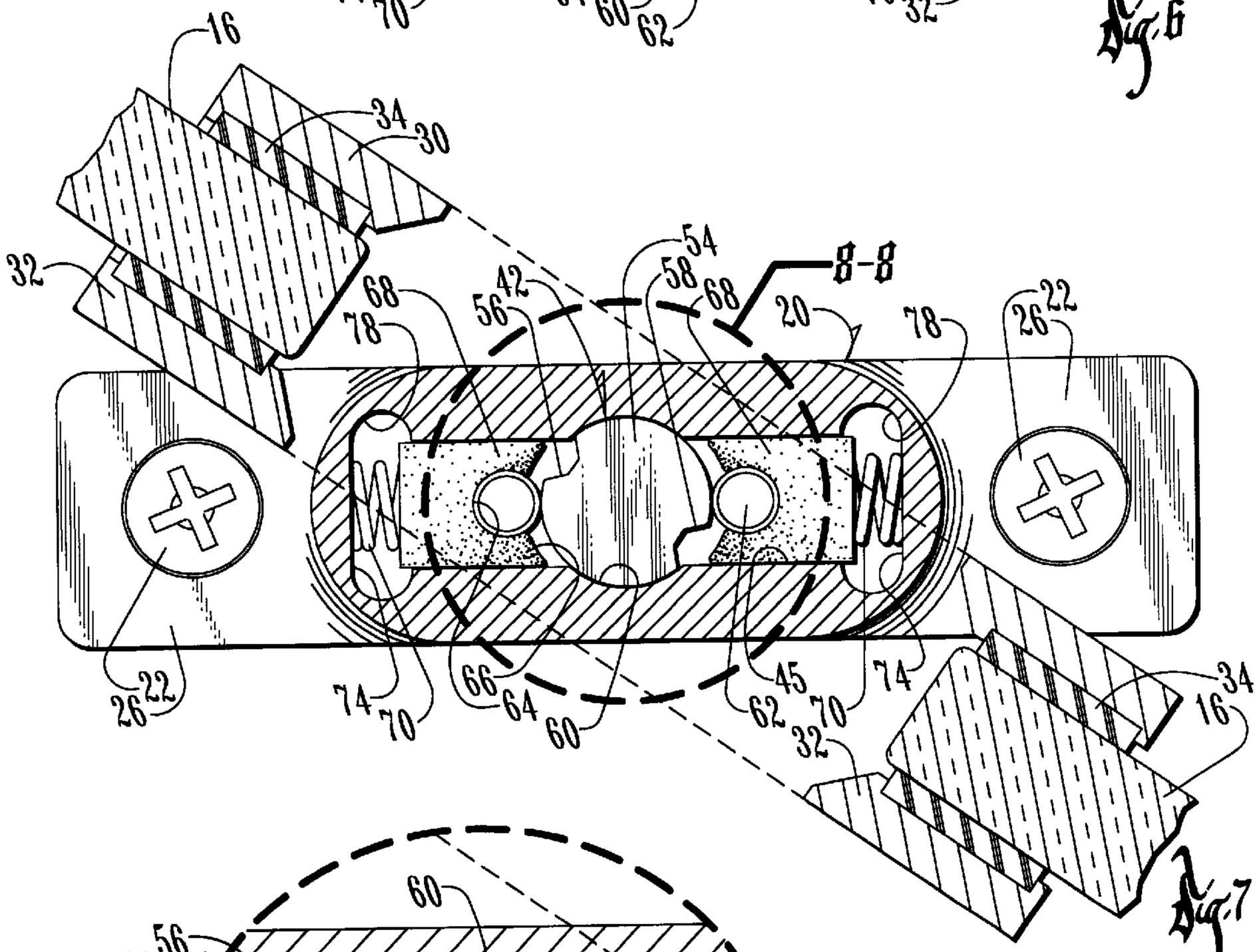


Fig. 7

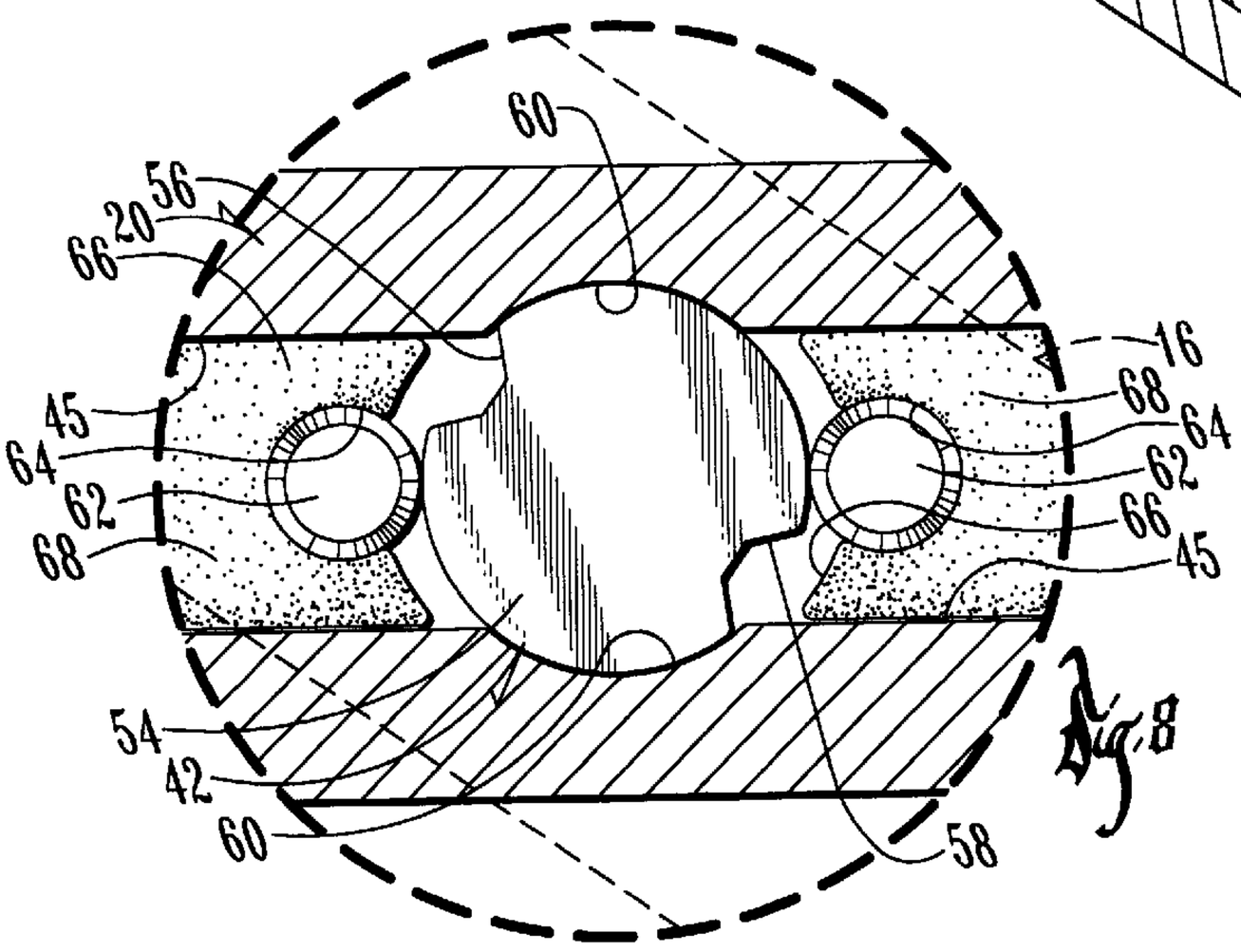
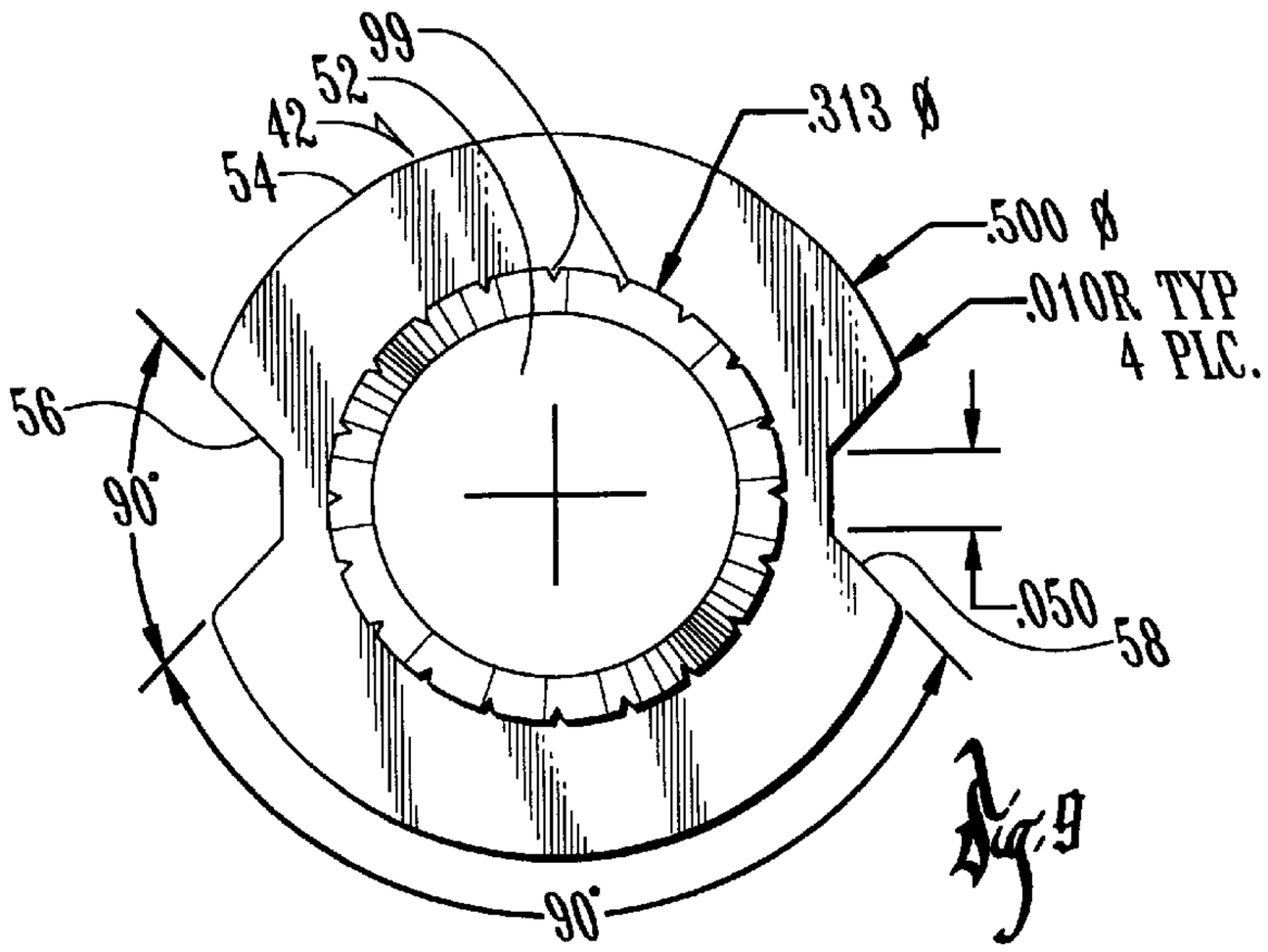


Fig. 8



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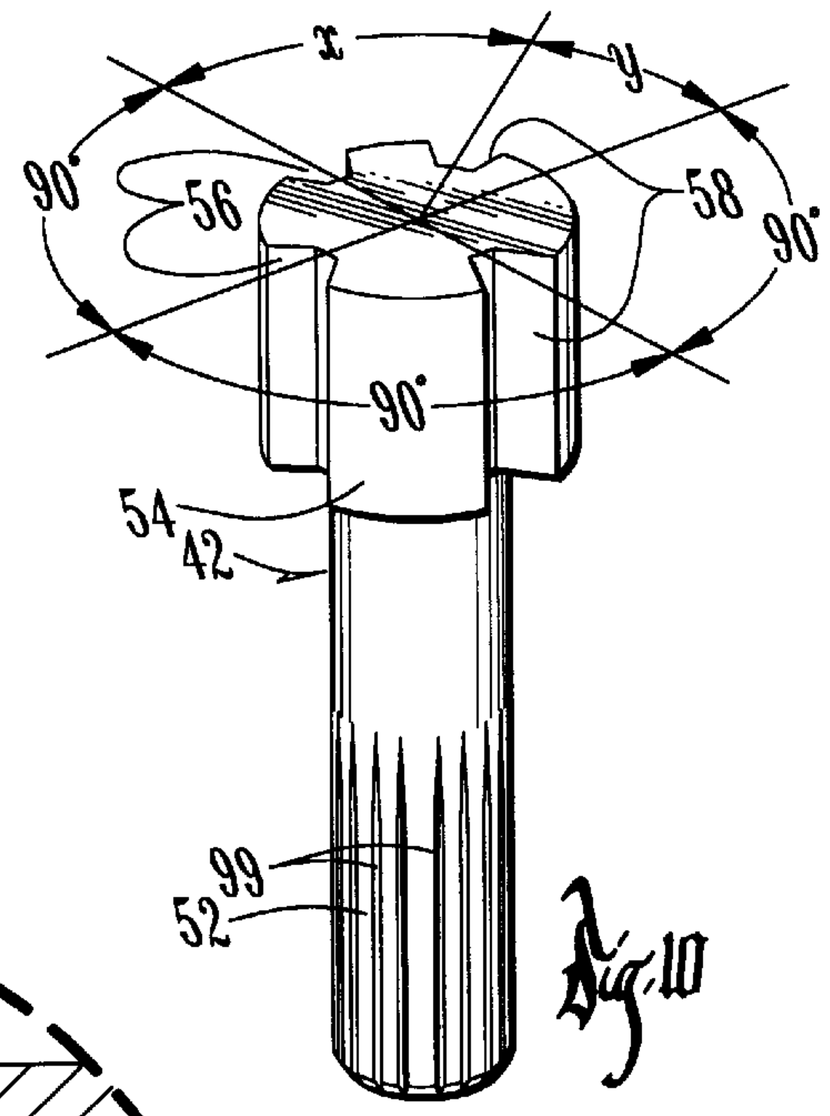

Fig. 10

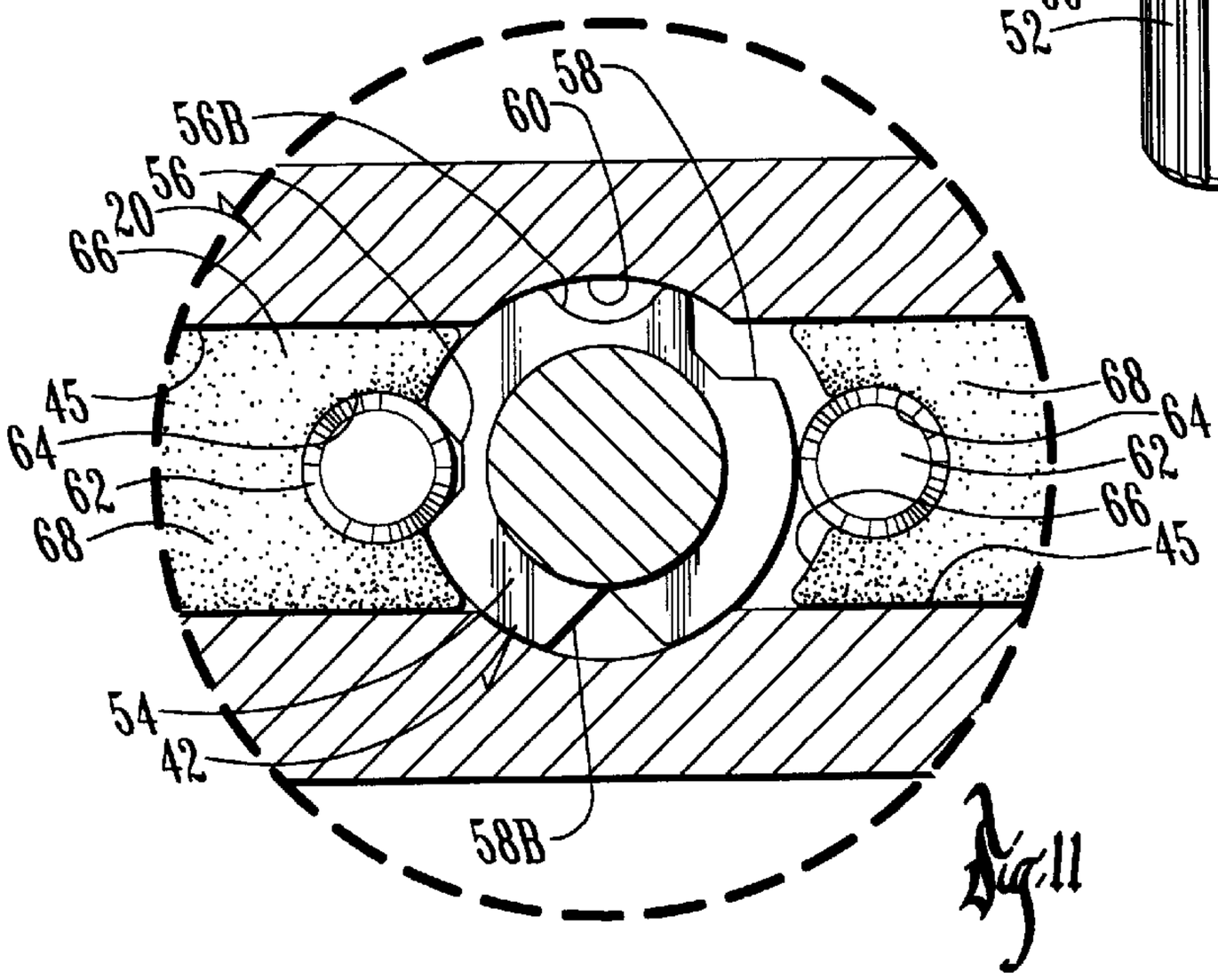

Fig. 11

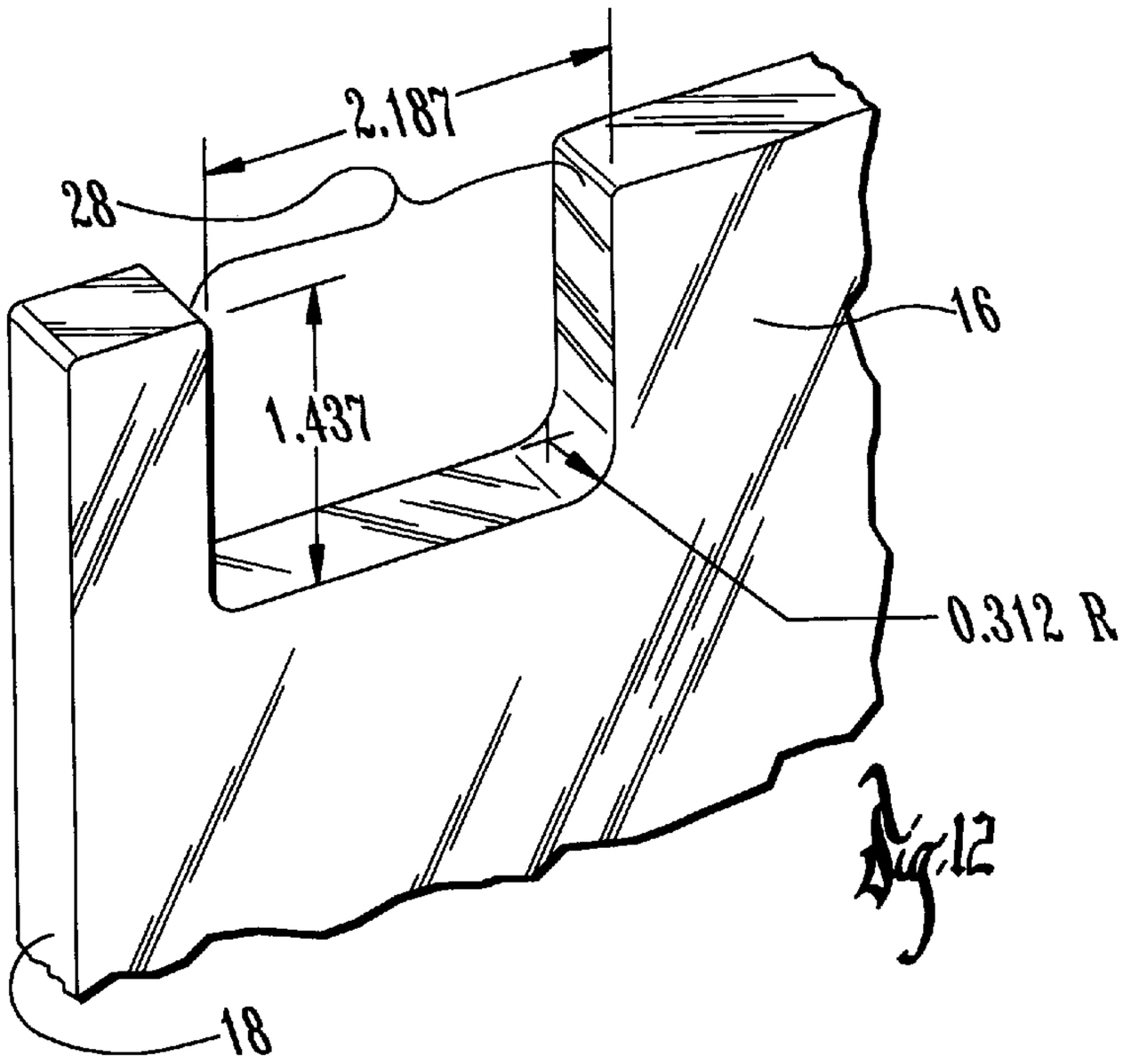
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Fig. 12

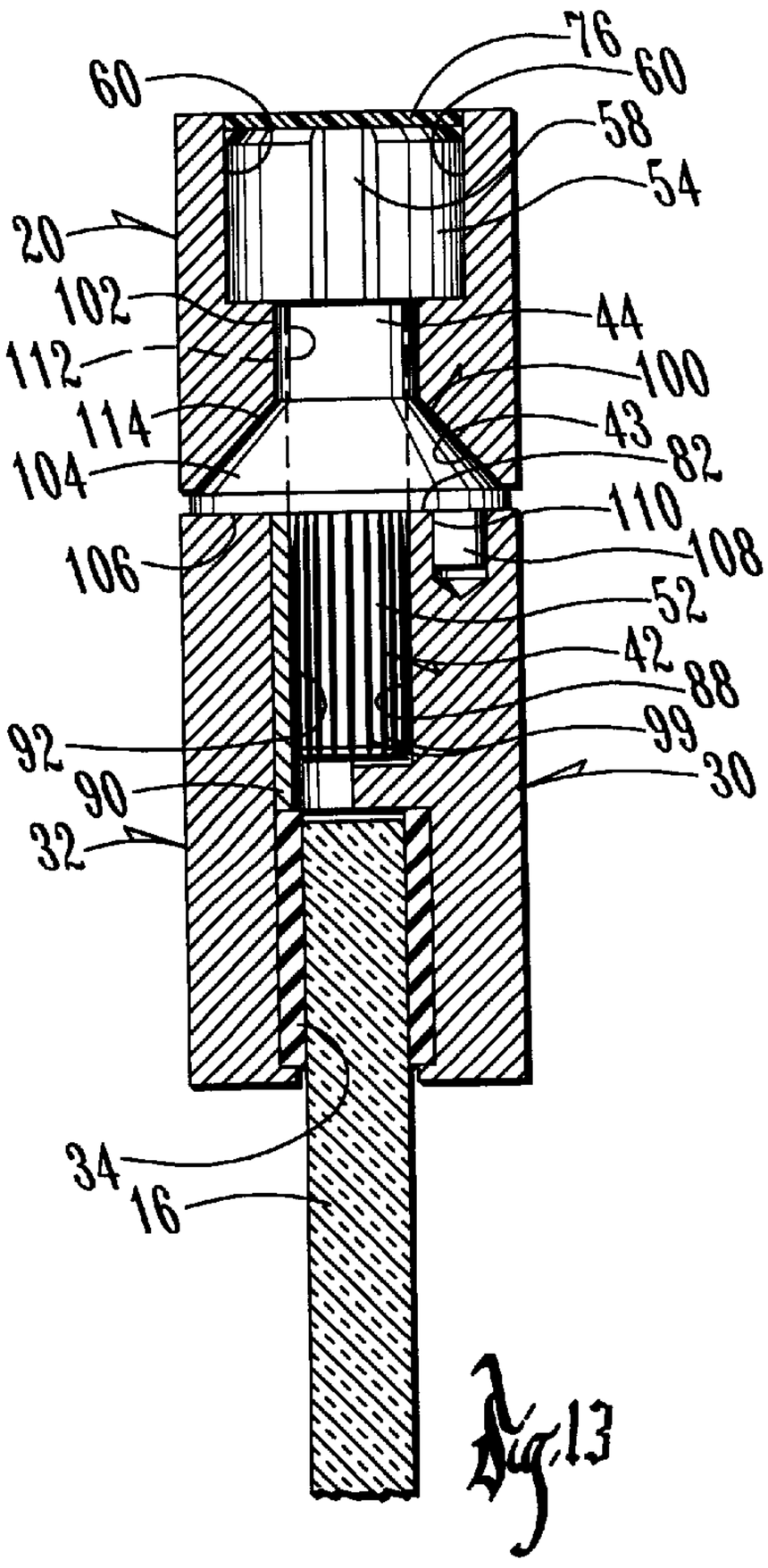
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Fig. 13

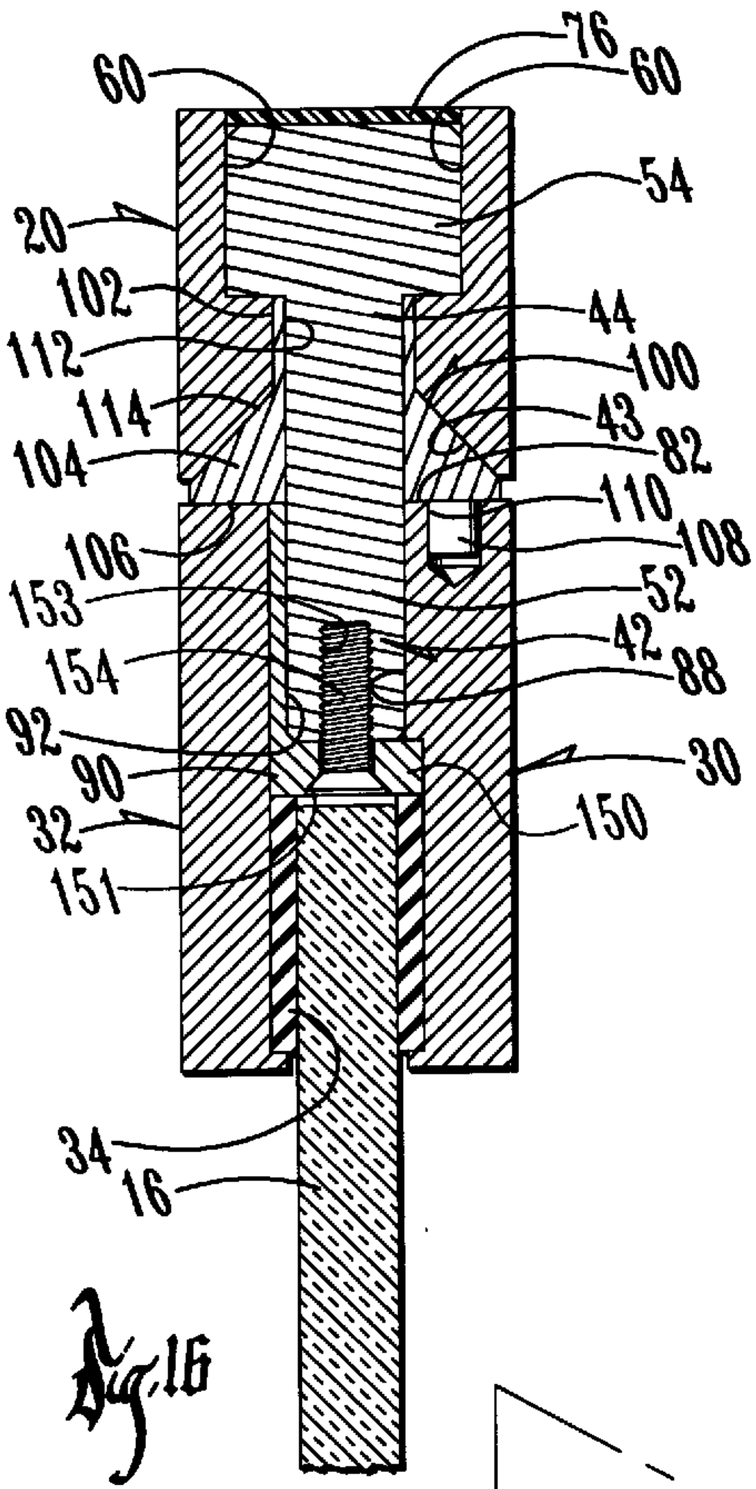


Fig. 16

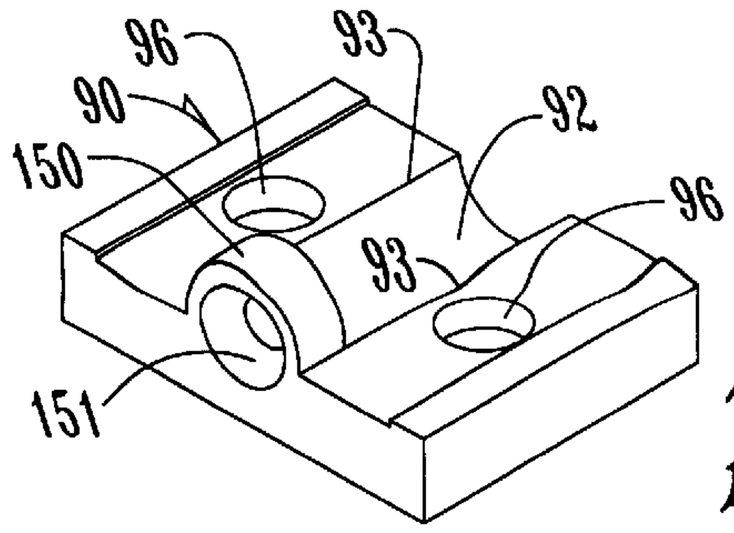
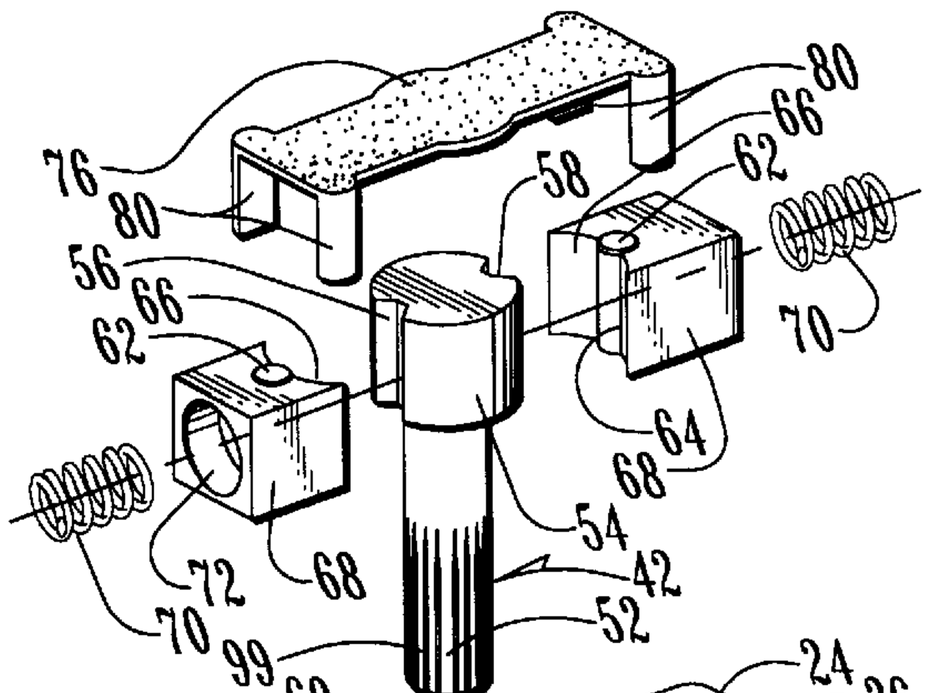


Fig. 15



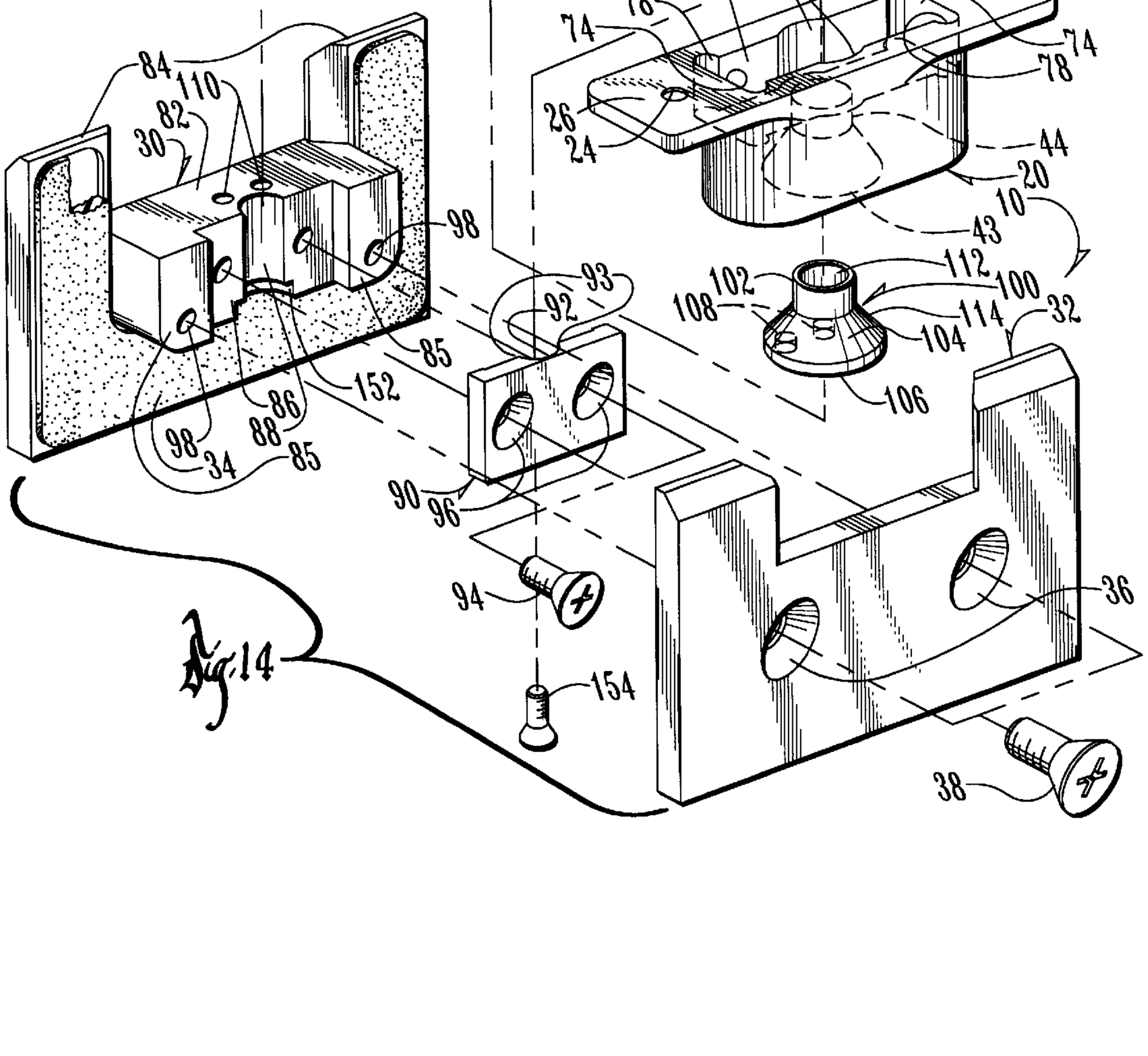


Fig. 14

PRESSURE HINGE DEVICE FOR GLASS DOOR OR PANEL

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to hinges, and in particular, to hinges that are self-indexing.

2. Problems in the Art

Many different styles and configurations of hinges have been developed over the years. The style and configuration of a hinge can depend substantially upon special needs for the hinge. For example, sometimes there is a need or desire for self-indexing. By self-indexing it is meant that the hinge will hold the pivoting door in a certain position until or unless someone provides sufficient force to move it out of that position. The position discussed is the indexed position.

Therefore, with or without a latch, the door may be kept in a normal or in an indexed position without the door freely pivoting. Then the door can be indexed to one or more positions.

Certain hinges also must support heavy doors. Some must work with doors that are difficult to mount to a hinge. An example of a heavy and difficult to mount door is a glass panel door, an example of which is a ⅜" to ½" glass shower door.

Some hinges also must operate in difficult environments. An example is a shower door which will be in a very humid environment. The hinges will experience substantial humidity and direct contact with water. They also may experience harsh cleaning agents or procedures.

As can be appreciated, certain materials and certain hinge needs therefore require special handling. For example, glass panel shower doors are heavy, difficult to mount, the environment is difficult, and it is many times desirable to have self indexing so that the door cannot freely pivot.

Co-owned pending U.S. Ser. No. 08/319,468, now U.S. Pat. No. 5,867,869, incorporated by reference herein, discloses a hinge that can be advantageously used with glass panel shower doors and provide self or automatic indexing. A main pivot pin includes at least one indexing detent parallel to the pivot axis for the hinge. A subroller pin is held against lateral movement but is biased against the main pivot pin in alignment with a portion of the pin bearing the detent. The main pivot pin rotates with the opening and closing of the shower door. When the main pivot pin and subroller pin are aligned, the subroller pin is forced into at least a part of the detent. This provides the indexing. One only has to apply enough force to the door to cause the subroller pin to move out of the detent to pivot the door and move the door out of its self indexed position.

The above described hinge represented a durable and improved apparatus and method for a self indexing door, especially for glass panel shower doors. The position of the detent is adjustable relative to flattened opposite portions of the main pivot pin that matingly fit into receivers in the other half of the hinge so that different indexed positions are possible. The flattened portions in the receivers thus keep the detent in a stationary position. Rotation of the door would cause the main pivot pin and detent to rotate relative to the fixed sub roller pin. Thus the detent, in operation, was always fixed relative to the door. Different main roller pins could be manufactured with the detents in different positions to provide different self-indexing positions.

Although the above hinge represented in an improvement in the art, it has become recognized that there is still room

for improvement. With the above-described hinge, the installer must very accurately mount the portion of the hinge that receives the main pivot pin. If mis-aligned even slightly horizontally relative to the other half of the hinge the indexing may not work properly. Also, the hinge, as disclosed in Ser. No. 08/319,468, now U.S. Pat. No. 5,867,869, is attached only to the side of the door. There are situations where hinges at the top and bottom of the door might be desired.

Real needs in the art have therefore been identified. It is therefore a principal object of the present invention to provide an apparatus and method which improve upon the state of the art. Other objects, features, and advantages of the invention include:

1. Positive yet adjustable self-indexing of a pivoting door.
2. Durability in many environments including high humidity and direct contact with water.
3. Adaptability to many different uses.
4. Reduction in the need for highly precise mounting of the hinge halves.
5. Adaptability to top and bottom hinges or side hinges.
6. Multiple indexing positions.
7. Strength to support relatively heavy doors.

These and other objects, features, and advantages of the present invention will become more apparent with reference to the accompanying specification and claims.

SUMMARY OF THE INVENTION

The present invention is an apparatus and method related to an indexing hinge. A mounting base is securable to a supporting structure. The supporting structure can be above or below the door but is not necessarily so limited. A mounting member is securable to the item to be pivoted. A pivot pin having a pivot axis is secured relative to one of the mounting base or the mounting member. The pivot pin has an indexing detent along its longitudinal length. A biased member is generally fixed in the other of the mounting member and mounting base but biased against the perimeter of the pivot pin. The biased member has biased supports relative to the pivot pin so that upon alignment of the detent with the biased member, the biased member at least partially enters the detent to provide an indexed catch or stop. Release from the indexed catch or stop is possible upon the application of sufficient forces to rotate the pivot pin so that the detent moves away from the biased member.

The method according to the invention includes securing the first member to the perimeter of an item to be pivoted. A second member is secured to a supporting structure. An indexing detent is formed along the longitudinal axis of a pivot pin positioned between the first and second member. A biased member is biased against the pivot pin and at least partially enters the indexing detent when aligned with the biased member, thereby aligning the indexing detent when pivoting the item to be pivoted to an indexed position.

In one embodiment of the invention, the mounting member is clamped or secured to a glass panel shower door and the mounting base is secured to the framework surrounding the opening to the shower. The hinge can work by clamping to the top and bottom of the shower door with the mounting g members being secured to the floor or stoop of the shower opening and soffits, header or sidelight above the shower door.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a glass panel shower door pivotally secure at the left top and bottom to supporting structure above and below the opening to the shower.

FIG. **2** is an enlarged isolated perspective view of an indexing hinge according to a preferred embodiment of the invention.

FIG. **3** is a still further enlarged sectional view taken along line **3—3** of FIG. **2** and including the sectional view of a glass panel shower door to which the indexing hinge is mounted. FIG. **3** illustrates the indexing hinge attached to the upper left side of a glass panel shower door and ghost lines indicate pivoting of the shower door in two directions.

FIG. **4** is similar to FIG. **3** except it illustrates the indexing hinge according to the preferred embodiment of the present invention secured to the center of the glass panel shower door. Ghost lines show pivoting in opposite directions of the shower door.

FIG. **5** is an exploded perspective view of the indexing hinge of FIG. **2**.

FIG. **5A** is an enlarged isolated view of a bearing support used in the hinge of FIG. **5**.

FIG. **6** is an enlarged sectional view taken along lines **6—6** of FIG. **2**. FIG. **6** shows attachment of the indexing hinge to a glass panel shower door and the indexing mechanism of the hinge. FIG. **6** shows the door in the indexed position.

FIG. **7** is similar to FIG. **6** except it shows the glass door and the portion of the indexing hinge secured to the glass door rotated out of the indexed position.

FIG. **8** is an enlarged view of the portion indicated by line **8—8** in FIG. **7**.

FIG. **9** is an enlarged bottom end view of the main pivot pin and indexing detents of the main pivot pin shown in perspective in FIG. **5** and cross section in FIGS. **6–8**.

FIG. **10** is an enlarged perspective view of an alternative embodiment of a main pivot pin.

FIG. **11** is similar to FIG. **8** which showing the main pivot pin in FIG. **10** in place in the indexing hinge according to the present invention.

FIG. **12** is an isolated, partial perspective view of a glass panel shower door and cut out to receive the indexing hinge of FIG. **1**.

FIG. **13** is a sectional view taken along line **13—13** of FIG. **3**.

FIG. **14** is an alternative embodiment of FIG. **5**.

FIG. **15** is an enlarged perspective view of part **90** of FIG. **14**.

FIG. **16** is an enlarged sectional view similar to FIG. **13** but showing the embodiment of FIGS. **14** and **15**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

To obtain a better understanding of the invention, detailed description of one preferred embodiment the invention can take will now be set forth. Frequent reference in this description will be taken to the drawings. Reference numerals will be used to indicate certain parts and locations in the drawings. The same reference numerals will be used to indicate the same parts and locations throughout the drawings unless otherwise indicated.

The preferred embodiment is discussed relative to a glass shower door, such as is well-known, pivotally secured in the opening to a shower. No mechanical latch or lock or sill need to be used with the door although such is not precluded. The indexing hinges according to the present invention are placed at the top and bottom of the door and therefore have to be secured to supporting structure above and below the door. It is to be understood, however, that the indexing hinge according to the present invention is not necessarily limited in those ways.

FIG. **1** shows top and bottom hinges **10** mounted respectively to the soffit or overhead defining the top of the opening into a shower (reference number **12**) and the stoop or bottom defining the bottom of the opening into the shower (reference number **14**). Each hinge is secured to the top and bottom of shower door **16** but near to the left side **18** of door **16**, is viewed in FIG. **1**. Door **16** pivots about a pivot axis that extends through hinges **10**. A handle **19** on the opposite side of door **16** can optionally be used to open and close door **16**.

Therefore, as shown in FIG. **1**, the vertical pivot axis through hinges **10** allows door **16** to be pivoted around that vertical pivot axis between a closed position (as shown in FIG. **1**), and open positions. The opening to the shower may or may not have a sill, jamb or stop to limit the pivotal movement of door **16**. Therefore, without such a blocking structure, door **16** could pivot or open both outwardly and inwardly with the only limit being the structure adjacent edge **18** of door **16**, if door **16** is rotated almost 360° in either direction.

FIG. **2** illustrates, in enlarged fashion, a hinge **10**. Because both top and bottom hinges **10** are identical in structure, only one will be discussed herein. The opposite hinge **10** simply needs to be reversed in orientation as is shown in FIG. **1**.

Hinge **10** comprises what will be called tram body **20** as a mounting member to the supporting structure defining the opening to the shower. Screws **22** can be placed through apertures **24** in flanges **26** of tram body **20** to mount tram body **20** to a soffit, stoop, or other structure defining the opening to the shower. Such structure can include overheads, sidelights, floors, walls, or any supporting structure. Other mounting hardware could be used such as is well within the skill of those skilled in the art. The glass shower door is gripped by a clamp comprising what is called pivot body **30** and a cover plate **32**. As will be discussed in more detail later, each of members **30** and **32** has a recess which includes a gasket **34** to grip the sides of the glass shower door. Cover plate **32** has apertures **36** into which screws **38** pass and mate into threaded apertures in pivot body **30**. Cover plate **32** and pivot body **30** can then be brought together to provide a clamping action on opposite exterior sides of door **16**. Reference can be taken to application Ser. No. 08/319,468 regarding the details of this clamping action. In a preferred embodiment, particular cutouts **28** in the margin of door **16** (see FIG. **12**) at the location of pivot body **30** are made to assist in secure mounting of hinge **10** to glass door **16**.

As will be further discussed below, a pivot pin has one end which is fixed in pivot body **30**. The opposite end of the pivot pin (not shown in FIG. **2**, but see FIGS. **3–5**) extends into tram body **20** where it is rotatably journaled. A pivot axis indicated generally at **40** in FIG. **2** is then defined. The configuration of the pivot pin and tram body **20** is such that upon rotation of pivot body **30** (and cover plate **32**), the pivot pin rotates in tram body **20** but pivot body cover plate **30/32** cannot be separated from tram body **20**.

FIGS. **3** and **4** show generally how hinge **10** allows pivoting movement of door **16**. It can be seen in FIG. **3**, tram body **20** is fixed from movement by its attachment to the soffit or overhang. It includes an aperture **44** in which a main pivot pin **42** is rotatably journaled. Pivot body **30** and cover plate **32**, with gaskets **34**, clamp door **16** at opposite sides of tram body **20**. Pivot pin **42** extends downwardly (FIG. **3** is

a top sectional view looking downward) to pivot body **30** where it is fixedly secured. Therefore, as is shown in dashed lines at **16**A and **16**B in FIG. **3**, door **16** can move away from the position in solid lines in either direction (see arrow **46**).

Note that in FIG. **3**, hinge **10** is attached to door **16** in the position shown in FIG. **1**, near side **18** of door **16**. Thus, door **16** pivots about its one side defined by side **18**.

In comparison, FIG. **4** shows how hinge **10** could be placed at or near the center top and bottom of door **16**, (with appropriate cutouts **28** as indicated at FIG. **12**). Tram body **20** would be fixed to the soffit or overhang at or near the center of the opening to the shower and likewise the second tram body **20** secured to the center of the stoop or bottom of the opening to the shower. Pivot body **30** and cover plate **32** would clamp door **16** at or near its top and bottom center and pivot pin **42** would be appropriately assembled. In this case the pivot axis for the door would essentially be down its center. As shown by arrows **48** in FIG. **4**, door **16** can potentially pivot in either direction but such pivoting would be down a vertical and central pivot axis. This is sometimes desired. Door **16**, if no mechanical stops existed around its perimeter, could rotate 360° or more in either direction.

FIG. **5** illustrates all the parts of hinge **10** in exploded fashion. Tram body **20** includes pivot pin aperture **44** which extends from an opening end **43** into an enlarged hollow **45**. The ghost lines of FIG. **5** illustrate portions **43**, **44**, and **45**. Main pivot pin **42** has a first end **52** that is slightly smaller in diameter than the inside diameter of pivot pin aperture **44**. A second end **54** of main pivot pin **42** has a larger diameter than first end **52**. End **54** also contains longitudinal detents **56** and **58**.

The diameter of opposing concave walls **60** on opposite sides of hollow **45** are slightly bigger in diameter than the diameter of end **54** of main pivot pin **42** and receive end **54**. Because end **54** is larger in diameter than pivot pin aperture **44**, main pivot pin **42**, when assembled, results in its end **52** being rotatably journaled in pivot pin aperture **44** but with the outermost portion of end **52** extending through and outside of portion **43**. End **54** of main pivot pin **42** is rotatably journaled in opposing concave walls **60** but cannot move into pivot pin aperture **44** because aperture **44** is smaller than end **54** of pivot pin **42**.

Biasing members are installed in tram body **20** on opposite sides of end **54** of main pivot pin **42**, when installed, to provide indexing for hinge **10**. As shown in FIG. **5**, each biasing member comprises a sub roller pin **62** of metal, force fit into a complimentary groove **64** in the concave face **66** of spring guide **68**. A spring **70** has one end which enters cutouts **72** in the portion of spring guide **68** opposite concave face **66**.

As shown in FIG. **5**, there is a biasing member combination (spring guide **68**, sub roller pin **62**, and spring **70**) on each side of end **54** of main pivot pin **42**. The combination of both biasing members and main pivot pin **42** are placed into hollow **45** by compressing springs **70** while spring guides **68** are against end **54** of main pivot pin **42**. As can be seen in FIG. **5**, hollow **45** includes opposite end walls **74** which serve as fixed walls of abutment with opposite springs **70**.

Once the biasing members and main pivot pin **42** are assembled into hollow **45** and pivot pin aperture **44**, base cover **76** is inserted over large hollow **45**. As can be seen in FIG. **5**, enlarged portions **78** on opposite sides of end walls **74** of hollow **45** receive legs **80** of base cover **76** to assist in positioning and holding base cover **76** in position. Note also that the perimeter of base cover **76** follows the outline of hollow **45**. Once assembled, tram body **20** and main pivot pin **42** are such that end **54** of main pivot pin **42** is rotatably journaled between opposing concave walls **60**. Sub roller pins **62** are biased against the perimeter of end **54** of main pivot pin **42** by springs **70** and spring guides **68**. As previously mentioned, main pivot pin **42** cannot move further towards pivot pin aperture **44** because of its size. Once tram body **20** is installed against the supporting surface by screws **22** (see FIG. **2**), main pivot pin **42** cannot move out of tram body **20** in any direction. It can rotate about axis **40** (see FIG. **2**). See FIG. **13**, a cross-sectional view of assembled hinge **10** to more clearly see the relationship of parts of hinge **10**.

Also, once tram body **20** and pin **42** are assembled, end **52** of main pivot pin **42** extends substantially outside of tram body **20**. As will be discussed below, this free end **52** of pin **42** will be received and fixed in pivot body **30**. FIG. **5** also shows pivot body **30** has a main portion **82** and a clamping portion **84**. Main portion **82** includes a top surface **85**, a depression **86**, and a concave cutout **88**. A clamp block **90** has perimeter dimensions to fit within depression **86** and be secured in position by bolts **94** through apertures **96**. Clamp block **90** also includes a concave cutout **92** which lines up with concave cutout **88** of main portion **82**.

Cover plate **32** also includes a gasket (not shown in FIG. **5**) like gasket **34** of pivot body **30**. Top surface **84** of main portion **82** of pivot body **30** includes threaded apertures **98** to receive screws **38** to clamp cover plate **32** to pivot body **30**.

Final assembly of the total hinge **10** includes positioning the outermost portion of end **52** of main pivot pin **42** (extending out of tram body **20**) into cutout **88** of pivot body **30** and then securing clamp block **90** over end **54** of main pivot pin **42**. End **54** includes knurls or longitudinal cuts **99**. Concave cutout **92** of clamp block **90** is of a smaller circular diameter than the diameter of end **54** of main pivot pin **42**. Thus, the edges **93** on both sides of concave cutout **92** corporate with longitudinal cuts **99** to secure end **54** of main pivot pin **42** in pivot body **30** and hold it against rotation while clamped by clamp block **90**.

A support bearing **100** has a first end **102** that is received and mates into pivot pin aperture **44** in tram body **20**. The second end **104** of bearing **100** is cone shaped and larger in diameter than first end **102** and matingly fits into the cone shaped void **43** in tram body **20**. The outer end surface **106** of bearing **100**, being flat, includes two pins **108** which mate into holes **110** in portion **82** of pivot body **30** (see FIG. **13**).

Thus, end **52** of main pivot pin **42** passes closely through the hollow channel **112** in support bearing **100** and is clamped by clamp block **90** into concave cutout **88** pivot body **30**. Support bearing **100** is fixed from rotation by pins **108** in holes **110**, and abuts but separates pivot body **30** from tram body **20** and provides a bearing surface **114** between the adjacent surface of tram body **20** (in void **43**) (see FIG. **13**). Tram body **20** will be fixed to a wall. Bearing **100** is fixed to pivot body **39**. Thus pivoting of pivot body **30** will cause pivot bearing **100** to rotate in void **43** of tram body **20**.

FIGS. **6–8** illustrate the operation of hinge **10**. FIG. **6** shows, in sectional view, the assembled indexing hinge **10**. FIG. **6** is a view looking down on top of end **54** of main pivot pin **42**. Pivot pin **42** has a rotational position such that detents **56** and **58** align with sub roller pins **62**. As can be seen, each spring **70** push against a wall **74** and thus bias spring guides **68** towards pivot pin **42**. This in turn biases sub roller pins **62** against the perimeter of end **54** of main pivot pin **42**.

Note that the diameter of sub roller pins **62** is larger than the distance across detents **56** and **58**, but is small enough so that a portion of sub roller pin **62** enter detents **56** and **58**. By this manner, when door **16** is in the position shown in FIG. **6**, it is indexed. By indexing it is meant that the entry of sub roller pins **62** into detents **56** and **58** tends to hold door **16** against rotation.

FIG. **7** shows door **16** rotated from the position of FIG. **6**. Because end **54** of pivot pin **42** is clamped to pivot body **30**. Pivot pin **42** rotates with the pivoting of door **16**. Therefore, if sufficient force is applied to door **16** to overcome the forces of sub roller pins **62** biased into detents **56** and **58**, end **54** of main pivot pin **42** will rotate out of alignment with sub roller pins **62**. Springs **70** will continue to bias sub roller pins **62** against the perimeter of end **54** of main pivot pin **42**, but since sub roller pins **62** are not in detents, there is no indexing or tendency to hold door **16** from rotation. Sub roller pins **62** would follow the smooth convex portions of end **54** of pivot pin **42** between detents **56** and **58**, and not impede rotation of door **16**.

FIG. **8** shows in enlarged detail the relationship of detents **56** and **58** to sub roller pins **62** when door **16** is rotated from the indexed position.

The included preferred embodiment is given by way of example only, not by way of limitation to the invention, which is solely described by the claims herein. Variations obvious to one skilled in the art will be included within the invention defined by the claims.

It will be appreciated that the relative dimensions and materials of parts of hinge **10** can vary according to desire and need. FIG. **9** illustrates certain dimensional characteristics of main pivot pin **42** according to the preferred embodiment described herein. Main pivot pin **42** is 1.456 inches in total length, with first end **52** being 1.081 inches in length. The knurling or longitudinal cuts can be 0.75 inches long from the end inwardly.

The radial depth of detents **56** and **58** can be approximately 0.615 inches. The material of pivot pin **42** can be 303 stainless steel. Sub roller pins can be 0.094 inches in diameter and also made of stainless steel. Spring guide **68** can be nylon 0.445 inches long and 0.370 inches wide. Springs **70** are compression type springs and have a length of 0.447 inch, a diameter of 0.300 inch, a gauge size of 0.063 inch, spring constant of 542.37 #/in. and are stainless steel 17-7 passivated. Tram body **20** is made of brass 3600. It is 3.375 inches end to end. It is 0.872 inches from bottom to top. It is 1.650 inches from end wall **74** to end wall **74**. The radius of concave faces **60** is 0.510 inch.

Pivot pin aperture **44** is 0.406 inch in diameter. Countersunk void **43** widens at a 45 degree angle from 0.406 inch to 0.75 inch diameter to receive end **102** of bearing **100** and bearing surface **114** of the second end **104** of support bearing **100**. Bore **112** through bearing **100** is 0.320 inches in diameter.

Support bearing **100** is made of nylon 6-6 and has a 0.396 inch outside diameter. Surface **114** is 135 degrees from the sidewall of end **102** of bearing **100**. The distance between opposite end surfaces of bearing **100** is 0.456 inches, the length of first end **102** is 0.231 inches. The distance from the end of first end **102** to the end of bearing surface **114** is 0.366 inches. The height of pins **108** is 0.125 inches and their diameter is 0.125 inches. They are spaced apart linearly 0.375 inches.

Pivot body **30** is made of brass 3600. Flanges **26** are 0.2 inches thick with the recesses for gaskets being 0.055 inches (also see FIG. **5**).

The longest dimension of portion **82** is 2.0 inches and its width is 0.75 inches. Depression **86** is 0.144 inch deep and concave cutout **88** has a radius of 0.156 inch compared to the 0.141 inch radius of concave cutout **92** of clamp block **90**.

Cover plate **32** is made of brass 3600, has a thickness of 0.200 inch with recess depth of 0.055 inches for the gasket **34** which is 3⁄32" thick.

Cutouts **28** in door **16** to receive portion **82** of pivot body **30** are 2 3⁄16 inches long and 1 7⁄16 inches in depth from the edge of door **16**. Corners are cut at a radius of 5⁄16 inch to correspond to the rounded corners on pivot body **30**.

Clamp block **90** is made of brass 377 and has outside dimensions of 0.990 inch long and 0.750 wide. It is 0.200 inch thick with the 0.155 inch radius for concave cutout **92**. It can also have a slight depression of approximately 0.015 inches on either side and including concave cutout **92**.

Gasket **34** are neoprene 3⁄32 inches 85 Duro Neoprene in a C-shape. They are 3.255 inches long and 1.880 inches wide. Each leg of the C-shape is 0.568 inches wide. The interior of the C-shape is 1.315 inches by 2.120 inches with a radius of 0.25 inches curved interior corners. The exterior curved corners are 0.125 inch radius.

Base cover **76** is nylon 6-6 having a total overall length of 1.640 inches and a thickness of 0.058 inches. The height of legs **80** is 0.433 inches.

FIG. **9** illustrates the use of two detents **56** and **58** for main pivot pin **42**. Thus, in the indexed position, two sub roller pins **62** and two detents **56** and **58** simultaneously work to hold the door in the indexed position. However, it is to be understood that one detent and one sub roller pin could be used. Alternatively more than two sub roller pins **62** and detents could be used. The precise shape of the detents can vary (see e.g. **56**B and **58**B FIG. **11**). As shown in FIGS. **6** and **11**, sub roller pin **62**, when in a detent, abuts at two points on opposite sides of the detent.

FIGS. **10** and **11** illustrate that the detents do not have to be at 90 degrees to one another. If multiple indexing positions are desired, one or more detents can be placed at other than 90 degrees to one another. If, for example, an indexed position at 45 degrees was desired, the detent would simply have to be formed at the appropriate position. Any angle is possible. This further highlights that if an indexing position different from an original indexing position is desired, pin **42** would merely have to be changed rather than the entire hinge.

It is to also to be understood that an advantage of hinge **10** is that it is adjustable after tram body **20** has been installed. As previously mentioned, if, for example, mounting holes for tram body **20** are drilled into a supporting wall but are not perfectly aligned with the plane of the opening to the shower, tram body **20** can still be installed into those drilled holes and the proper indexing can work. Therefore, even though the relationship between the detents in pin **42** and the sub roller pins **62** is fixed when tram body **20** and pivot pin **42** are assembled, end **52** of main pivot pin **42** can be placed into concave cutout **88** in pivot body **30**, the door adjusted to the desired indexed position, and then clamp block **90** secured to pivot body **32** to fix the orientation of door **16** to hinge **10**. Thus, by aligning the detents **56** and **58** with sub roller pin **62** when mounting tram body **20**, the installer can compensate for any misalignment in installation of tram body **20** by this method.

It is furthermore emphasized that as shown in the drawings, indexing hinge **10** can be used either at the top and bottom and towards the either side of door **16**, or towards the middle of the top and bottom of door **16**. In fact, any

locations along the top and bottom of door **16** are possible. By appropriate modifications, hinges **10** can also be used along either vertical side of door **16**.

An alternative concept is shown at FIGS. **14–16**. It may be advantageous in certain circumstances to fix pivot pin **42** in place in the hinge. One such circumstance is when the hinge is installed upside down. To reduce end play, clamp block **90** could include a protrusion **150** (FIG. **14**) that includes an aperture **151** therethrough. A mating hollow **152** (FIG. **14**) could be formed in pivot body **30** to receive protrusion **150** when clamp block **90** is assembled thereto.

Pivot pin **42** can have an axial threaded bore **153** (FIG. **16**). A machine screw **154** could pass through aperture **150** in clamp block **90** and into bore **153** to fix pivot pin **42** in place to reduce or eliminate end play.

What is claimed is:

1. A hinge for a panel door comprising:

a mounting base to facilitate mounting of the base to a supporting structure above or below a door;

a mounting member including portions to facilitate mounting of the mounting member to a peripheral top or bottom edge of a door;

a pivot pin extending between and having portions in the mounting base and the mounting member respectively and defining a pivot axis;

a fixing mechanism in one of the mounting plate and the mounting member, the fixing mechanism fixing the pivot pin in a selected rotational position in and disallowing rotational movement relative the said one of the mounting base and the mounting member;

an indexing mechanism in the other of the mounting base and the mounting member, the indexing mechanism including detent along the side of the pivot pin and a biased member having an end biased against the pivot pin, the biased member deterring rotation of the pin and the one of the mounting base and the mounting member relative to the other to allow indexing of a door by biasing the biased member at least partially into the detent when the biased member is in alignment with the detent, rotation of the pin and the one of the mounting base and mounting member relative to the other being allowed when sufficient forces are provided to overcome the biasing and move the detent of the pin out of alignment with the biased member.

2. The hinge of claim **1** wherein the panel door is a glass plate door.

3. The hinge of claim **2** wherein the glass plate door includes cutouts along its periphery.

4. The hinge of claim **1** wherein the mounting base includes mounting hardware to mount the mounting plate to a supporting structure.

5. The hinge of claim **4** wherein the supporting structure is selected from the set comprising a ceiling, floor, soffit, sidelight, header, and shower frame.

6. The hinge of claim **1** wherein the mounting member further comprises first and second portions, one removable relative to the other, each portion having a clamping surface, and further comprising means to adjust said first and second portions to apply clamping forces.

7. The hinge of claim **6** further comprising gaskets placable on or in the mounting member to provide a seal between the clamping surfaces and a door.

8. The hinge of claim **7** further comprising pockets formed in the clamping surfaces, each pocket configured to matingly receive a gasket, but when the gaskets are seated in the pockets, said gaskets extend above the clamping surfaces.

9. The hinge of claim **8** wherein the gaskets are made of neoprene.

10. The hinge of claim **1** wherein the portion of the pivot pin aligned with the fixing mechanism is knurled, and the portion of the pivot pin containing the detent is larger in diameter than the knurled portion.

11. The hinge of claim **1** wherein the fixing mechanism comprises a clamping block and an adjustable mounting hardware, a portion of the pivot pin being placed between the clamping block and, the adjustable mounting hardware, the adjustable mounting hardware being adjustable to provide clamping pressure sufficient to prevent rotation of the pivot pin relative to said clamping block.

12. The hinge of claim **1** wherein the detent comprises a groove.

13. The hinge of claim **12** wherein the groove is generally V-shaped.

14. The hinge of claim **13** wherein the groove has a flat central longitudinal portion and outwardly diverging opposite walls.

15. The hinge of claim **14** wherein the walls are at approximately 90 degrees to one another.

16. The hinge of claim **1** wherein the pin includes a plurality of detents.

17. The hinge of claim **16** wherein two detents are spaced 180 degrees apart from one another around the pivot pin.

18. The hinge of claim **1** wherein the biased member comprises a surface which at least partially fits within a detent.

19. The hinge of claim **18** wherein the surface comprises a convex surface.

20. The hinge of claim **19** wherein the surface is the outer surface of a roller pin.

21. The hinge of claim **20** wherein the biased member is a roller pin, the detent is a V-shaped groove, the diameter of the roller pin is greater than the largest width of the V-shaped groove.

22. The hinge of claim **21** further comprising a mounting block holding the roller pin but exposing a part of the outer curved surface of the roller pin, and further comprising a spring positioned between the mounting block and the other of the mounting base and mounting member.

23. The hinge of claim **22** further comprising first and second biased members positioned in the other of the mounting base and mounting member and first and second detents in the pivot pin.

24. The hinge of claim **1** further comprising a bearing member positioned between the mounting base and the mounting member.

25. The hinge of claim **1** further comprising in combination with said hinge, a panel door.

26. A shower door hinge for mounting a panel shower door and providing indexing for the door comprising:

a base attachable above or below a door including means for securement to a supporting structure above or below a door;

a clamping mechanism having first and second surfaces and an adjustable connection operable to move the first and second surfaces together adapted to provide clamping action on a perimeter portion of the door;

a main shaft having a longitudinal axis and first and second ends, the second end including at least one indexing detent aligned along the longitudinal axis;

a tram body on the base, the tram body comprising a block, an opening in the block, a sub-roller pin, and a bias member, the second end of the main shaft being rotatably positioned in the opening in the block, the first

end of the main shaft extending out of the opening in the block, the sub-roller pin in parallel with the longitudinal axis of the main shaft and biased into abutment with the second end of the main shaft;

a pivot body on the clamping mechanism, the pivot body comprising a complementary receiver for the first end of the main shaft and a securement mechanism which fixes the first end of the main shaft in the pivot body in an adjustable selected rotational orientation relative to the pivot body;

so that when the sub-roller pin is aligned with the indexing detent, the biased member causes automatic indexing of the hinge and requires force sufficient to move the sub-roller pin out of the detent to rotate the tram body relative to the pivot body, and so that any rotational orientation of the pivot body relative the tram body when the sub-roller pin is in the detent can be adjustably selected.

27. The hinge of claim **26** wherein the panel shower door is glass plate.

28. The hinge of claim **26** wherein the base is adapted for attachment at the top or bottom of a door but near a side of a door.

29. The hinge of claim **26** wherein the base is adapted for attachment at a top or bottom of a door but at or near the middle of a door.

30. The hinge of claim **26** wherein the base includes a plate having apertures for receiving securing members adapted for connection of the hinge to supporting structure.

31. The hinge of claim **26** wherein the clamping mechanism comprises two separate pieces joinable together to create clamping action.

32. The hinge of claim **26** wherein the detent comprises a V-shaped groove.

33. The hinge of claim **32** further comprising first and second detents spaced apart from one another around the exterior of the main shaft.

34. The hinge of claim **26** wherein the tram body is integral with the base.

35. The hinge of claim **26** wherein the tram body includes a cavity in which the subroller pin is movable laterally towards the main shaft.

36. The hinge of claim **26** wherein the bias member comprises a block in which the sub-roller pin is held and a spring that urges the block and thus the sub-roller pin towards abutment with the main shaft.

37. The hinge of claim **26** further comprising in combination said hinge with a class plate shower door.

38. A hinge comprising:

first and second mounts;

a pivot pin positionable in the first and second mounts along a pivot axis;

a clamp to adjustably secure the pivot pin to and prevent rotation of the pivot pin relative to the first mount;

a generally v-shaped slot extending parallel to the pivot axis along a portion of the pin in the second mount;

a sub-roller pin held in the second mount and positioned in abutment with said portion of the pin;

biasing means biasing the sub-roller pin against said portion of the pin.

39. The hinge of claim **38** wherein the second mount includes a plate adaptable for mounting to a supporting structure.

40. The hinge of claim **38** wherein the second mount comprises a clamp that can clamp a door edge.

41. The hinge of claim **40** wherein the door is glass plate.

42. The hinge of claim **38** further comprising a second V-shaped slot extending parallel to the pivot axis along a portion of the pin in the second mount.

43. The hinge of claim **42** wherein the second V-shaped detent is positioned approximately 180 degrees opposite the V-shaped slot along the same part of the pivot pin.

44. The hinge of claim **38** further comprising a second detent positioned along the same part of the pivot pin but angularly displaced around the circumference of the pivot pin from the first V-shaped slot.

45. The hinge of claim **38** further comprising in combination said hinge with a glass plate shower door.

46. The hinge of claim **38** further comprising in combination said hinge and said shower door with a shower assembly.

47. A method of pivotally mounting a glass plate shower door at the top and bottom of the door to supporting structure comprising:

clamping first members to a periphery edge of the door at aligned positions on the top and bottom of the door;

securing second members to supporting structure defining the opening for the door at positions aligned with the first members when the door is in operative position relative to the opening;

forming an indexing detent along a longitudinal axis of indexing portions of top and bottom pivot pins;

positioning the top and bottom pivot pins between each first and second member with the indexing portions in the second members;

biasing a member at least partially into the indexing detents;

adjustably fixing other portions of the top and bottom pivot pins in the first members;

thereby aligning the indexing detents at the top and bottom of the door for simultaneous operation when pivoting the door without having to mount the second members in precise rotational orientation to the door, first members, or pivot pins.

48. The method of claim **47** further comprising a plurality of detents, positioned in the same relative position in both pivot pins.

49. The method of claim **48** wherein the plurality of detents comprise two detents positioned approximately 180 degrees apart around each pivot pin.

50. The method of claim **49** further comprising fixing the pivot pin against axial movement relative to the hinge.

51. The method of claim **48** further comprising a second member which is biased at least partially into a second detent in a said pivot pin.

52. The hinge of claim **47** further comprising in combination said hinge with a glass plate shower door.

53. The hinge of claim **47** further comprising in combination said hinge and said shower door with a shower assembly.

54. A hinge for a panel door comprising:

a mounting base to facilitate mounting of the mounting base to a supporting structure above or below a door;

a mounting member to facilitate mounting of the mounting member to a peripheral top or bottom edge of a door;

a pivot pin extending between and having portions in the mounting plate and the mounting member respectively and defining a pivot axis which is generally parallel with a plane defining a door;

a fixing mechanism in the the mounting member, the fixing mechanism fixing the pin in a selected rotational position in and disallowing rotational movement relative to the mounting member so that the pin rotates with the mounting member;

an indexing mechanism entirely in the mounting base, the indexing mechanism allowing indexable rotation of the portion of the pivot pin in the mounting base.

55. The hinge of claim **54** further comprising herein the mounting base included a mounting surface adapted for abuttment with a supporting structure, the mounting surface including an opening into the mounting base to a cavity therein, the cavity containing the indexing mechanism.

56. The hinge of claim **55** wherein the mounting member has an outer end surface including an opening to receive a pivot pin and all other exterior surfaces devoid of openings or adjustment mechanisms.

57. The hinge of claim **54** wherein the indexing mechanism comprises a biasing member having a first end in abuttment with an interior surface of a mounting base an opposite end urged into abuttment with pivot pin.

58. The hinge of claim **57** wherein the biasing member comprises a first and second members extending from opposite sides of the pivot pin into abuttment with the pivot pin.

59. The hinge of claim **54** wherein only the pivot pin in the mounting base rotates with the mounting member.

60. The hinge of claim **59** wherein the biasing member has an end in abuttment with the pivot pin comprising roller pin oriented along the longitudnial axis of the pivot pin and elongated for an elongated surface area of contact with the pivot pin.

61. The hinge of claim **54** further comprising in combination said hinge with a glass plate shower door.

62. The hinge of claim **54** further comprising in combination said hinge and said hower door with a shower assembly.

63. A hinge for a panel door comprising:

a mounting base to facilitate mounting of the mounting base to a supporting structure above or below a door;

a mounting member to facilitate mounting of the mounting member to a peripheral top or bottom edge of a door;

a pivot pin extending between and having portions in the mounting plate and the mounting member respectively and defining a pivot axis which is generally parallel with a plane defining a door;

a fixing mechanism in the mounting member, the fixing mechanism fixing the pin in a selected rotational position in and disallowing rotational movement relative to the mounting member so that the pin rotates with the mounting member;

an indexing mechanism in the mounting base, the indexing mechanism allowing indexable rotation of the portion of the pivot pin in the mounting base;

a bearing positioned between the mounting base and the mounting member, the bearing taking a substantial amount of the load of the hinge.

64. The hinge of claim **63** wherein the bearing is made of a plastic material.

65. The hinge of claim **63** wherein the bearing is fixed relative to the mounting member so that the bearing rotates relative to mounting base.

66. The hinge of claim **63** where in the mounting base includes a conical shaped opening in its surface adjacent a mounting member and bearing comprises a shape complimentary to the conical opening so that the bearing surface of the bearing is substantially conical surface to conical surface.

67. The hinge of claim **66** further comprising in combination an architectural structure.

68. The hinge of claim **67** further comprising in combination said hinge and said shower door with a shower assembly.

69. The hinge of claim **63** further comprising in combination said hinge with a glass plate shower door.

70. The hinge of claim **63** further comprising in combination said hinge and said shower door with a shower assembly.

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UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 6,161,255
DATED : December 19, 2000
INVENTOR(S) : Rodney G. Garrett

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 11, claim 37,
Line 49, delete [class] and insert -- glass --.

Column 13, claim 62,
Line 36, delete [hower] and insert -- shower --.

Signed and Sealed this

Sixth Day of November, 2001

Attest:

Nicholas P. Godici

NICHOLAS P. GODICI
Acting Director of the United States Patent and Trademark Office

Attesting Officer